



**What you Always Wanted
to Know About Flock**



Ladies and Gentlemen,

> Flocking fascinates because a textile, velvety or brush-like surface may be applied to almost any material. Flocked products are everywhere and seen daily on T-shirts, packagings for perfumes, car glove boxes, floor coverings, model railway landscapes, eye liner brushes, scrubbing pads etc.

Here you'll find the basic information how flocking is done.

Your SwissFlock.



Flocked T-shirt

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Flocked paint rollers



Flocked pen case



Flock

> A surface is flocked by applying a special flock adhesive onto a substrate. Flock fibres are 'shot' into the still wet adhesive by electrostatic charge.

Any object enabling the adhesive to stick to it may serve as substrate, i.e. the surface has to be free from dust, grease, silicones, etc.

Principally, any textile fibre could be used for flock. The most common types of flock are made of polyamide, viscose or polyester. Depending on the thickness and the length of the fibres the touch of the surface can vary from velvety smooth to bristle-like.

Special electrically conductive adhesives are used as flock adhesive, which not only have to possess a good adherence to the substrate but also to the flock fibres. Depending on the final usage they have to fulfil further requirements such as resistance to washing, oil resistance, etc.



Flocked books

Flocked sealing

The flocking process includes the following steps:

- Applying the adhesive (by spraying, dipping, with a doctor knife, with a roller, with screen printing, etc.)
- Applying the flock with a flocking equipment
- Drying of the adhesive (at room temperature or elevated temperature)
- Cleaning, i.e. removing of loose flock fibres (by sucking off, blowing, knocking, brushing, washing, etc.)



Flocked tray

Flocking of sheets and 3D parts

> Flock may be applied onto nearly every substrate. The surface gets a velvety look and touch and offers several technical advantages, depending on the final purpose. For example, flocking is used to insulate against cold and heat, for noise reduction, as sealing, to prevent rattling and grinding noises, as a brush, etc.

Operating steps: First of all, flock adhesive is applied onto the areas to be flocked. The flock is applied into the wet adhesive immediately after that. In most cases this is done with a manual electrostatic flocking device or with an electrostatic flocking machine. In special cases, however, other application methods are used too. The flocked part is dried at room temperature or in a drier and finally cleaned from surplus flock.



Adhesive application

The adhesive application can be compared with a paint job and may be carried out with all those methods which are used for painting, i.e brushing, roller coating, spraying, with a doctor knife. Anyhow, the adhesive has to be prevented from reaching those areas which are not to be flocked. It is recommended to cover those areas with a mask or seal off with masking tape.



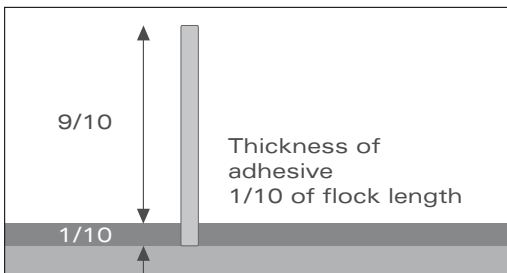
Spraying adhesive



Screen printing adhesive

The substrate has to be prepared in such a way that the adhesive is not absorbed by the surface. Therefore, with porous substrates (wood, chip board, etc.), a basic priming has to be applied prior to the adhesive coating, in order to properly close the pores. Without this procedure the flock adhesive will penetrate into the substrate during the drying process and the flock fibres do not cling properly to the surface, i.e. after the final cleaning bald areas show up.

In order to achieve a sturdy and abrasion resistant flocking, it is necessary that the flock fibers are not only adhered with their cut edges to the adhesive, but that they penetrate into the adhesive layer to approximately one tenth of their length. This means that the thickness of the dried adhesive has to be at least a tenth of the flock length. One has to pay attention to the fact that adhesives may contain solvent or water which are evaporating during the drying procedure. With water-based systems, these are approx. 50 %.



Example for 1 mm flock length and water-based adhesive:

The flock length of 1 mm requires 0.1 mm of dried adhesive layer;

0.1 mm of dried adhesive = 0.2 mm of wet adhesive,

0.2 mm of wet adhesive = 200 g/m² approx.

After application the adhesive starts to dry whereby the surface becomes more and more tenacious until a skin is formed. Already when the surface has become a bit tenacious, the flock fibres cannot penetrate into the adhesive film as deep as required, i.e. the flocking is not anymore resistant to abrasion. Therefore flocking is possible only as long as the adhesive has not become tenacious. The period of time during which the flocking has to be completed is called «open time». When choosing a flock adhesive, one has to take care that a type of adhesive is selected with a sufficiently long open time according to the size of the parts to be flocked and to the flocking method.

Two-component systems will start to react with each other, independently of the evaporation of water or solvents. Here as well the viscosity of the adhesive increases and a proper flocking is not possible any more. The period of time during which a two-component mixture of adhesive and catalyst has to be used up, is called «pot life». Naturally the drying time of an adhesive is the longer, the longer the pot life and the open time are.



Flocking of flat part



Flocking of glove box

Flocking

The actual flocking procedure is done with an electrostatic flocking device which charges the flock fibres with a voltage of 50 to 100 kV. By this, the flock fibres jump along the electrostatic field lines from the device to any earthed surface. Therefore a prerequisite for good and even flocking is that the part coated with the adhesive is connected to the earth wire of the flocking device.

If the substrate is an insulator an auxiliary construction may be necessary in order to give contact to the adhesive. The effect of the electrostatic field depends on the field strength resulting from the voltage at the equipment divided by the distance of the applicator to the part to be flocked. An even flocking requires that the applicator is moved over the surface with always the same distance (in most cases 5 to 10 cm). This is especially important when flocking depths and protruding edges as otherwise there may occur problems with uneven flocking. The perfect flocking requires a certain amount of experience and should only be carried out by experienced persons.



Flocking machine

The flock fibres have to have a sufficient electrical conductivity for good flocking. This is achieved by the electrostatic treatment of the flock fibres. Such treatment however, can only work in connection with humidity. It is therefore important that the air humidity during the flocking procedure is according to the recommendations of the flock producer. A too dry climate or a dried out flock may be recognized by the fact that it doesn't jump as individual fibres from the electrode to the part to be flocked, but forms trees and streaks formed by flock fibres clinging to each other. In this case, the flock fibres do not penetrate into the adhesive with the necessary energy and the flocking will not become abrasion resistant. When the humidity is too high, the flock becomes sticky and tends to form balls and agglomerations. It is strongly recommended to control temperature and humidity during flocking.

Drying and cleaning

The flocked parts are dried at room temperature or in a drier and after that cleaned from surplus flock fibres. The cleaning may be carried out by blowing off, sucking off, knocking off, brushing off or by washing. Often a combination of these methods is used.



Hygrometer with correct climate

Flock adhesives

Flock adhesives may be one-component or two-component water-based or solvent-based systems. With two-component systems it is extremely important that the individual components are precisely weighed. Moreover, a suitable pigment should be added in order to dye the adhesive to the colour of the flock. Thus, on the one hand the control of the proper adhesive coating is made easier and on the other hand slightly bald spots with less flock than normal are not noticed right away. When applying a dark flock onto a bright substrate a few percents of pigments added are quite sufficient. At least 10 percent of white pigments have to be added to the adhesive for white flocking onto dark surfaces. When flocking bright flock fibres onto a dark substrate (i.e. yellow flock onto a blue base), white pigments as well as pigments in the flock colour have to be added, as otherwise an optimum covering and colour shine cannot be achieved.



Adhesive, catalyst and pigment

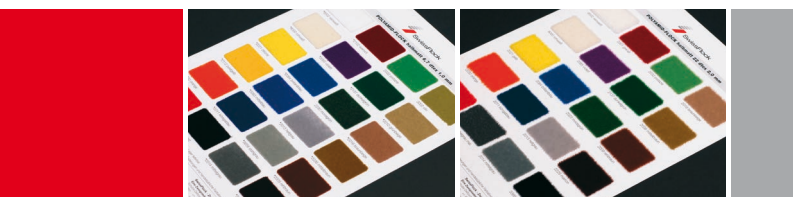
Flock

For the flocking of sheets and 3D parts mainly polyamide is used, as it is very pressure resistant (i.e. after being under pressure, the flock lifts up again and no pressure marks are visible). However, for some special cases other types of flock are used as well:

- One-way packagings are flocked with viscose (which is cheaper than polyamide).
- Rubber gloves are mostly flocked with cotton (absorbs humidity better than all synthetic fibres).
- Window channels for cars are flocked with polyester (is more light resistant than polyamide).

For normal application cases, we stock polyamide flock in 3.3 dtex / 1.0 mm, 6.7 dtex / 1.0 mm and 22 dtex / 2.0 mm in many different colours as per our colour cards. Colour shades which are not on stock may be achieved in most cases by mixing two or more flock colours. When doing this with 2.0 mm fibres, a colour blending effect happens which might even be desired for a decorative effect.

For all other types and colours please contact us in order to determine the best possible type of flock.



Polyamide colour card 1 mm

Polyamide colour card 2 mm

Flocking of textiles

> The motif flocking is the high-class alternative to textile printing. One not only flocks sports wear for schools, sport clubs, associations etc., but also fabrics for garments, door mats and a lot more textiles. The motifs may consist of labels, names, numbers, repeated designs or logos. Because of its elegant and relief-like appearance, flock is also used a lot for promotion articles.

Operating steps: A screen printing stencil is made from the desired motif. A special flock adhesive is applied through the stencil onto the fabric. Immediately after that flock is applied into the wet adhesive. The fabric is dried at room temperature or in a drier, and finally cleaned by removing surplus flock.



Flocked shirt

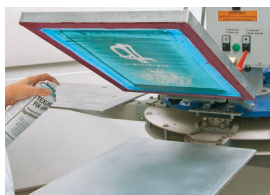
Stencil and screen

For textile flocking, mostly screen fabrics made of polyester are used, as this material possesses a very limited ability to absorb water and stays in form during washing-out and cleaning. Preferred are fabrics from 20T to 29T, i.e. 20 to 29 threads per cm. These are very coarse screens for the normal screen printing, but only with those the required thickness of adhesive can be achieved. The finer the lines or contours of the motif are, the finer should the fabric be chosen. The thickness of the adhesive should be 0.15 to 0.25 mm (wet), i.e. 150 to 250 g/m². Such thickness cannot be achieved with screen fabrics finer than 29T.

The screen printing frame should be made of aluminium (wood doesn't keep its form, steel rusts and stainless steel is very expensive). The size of the frames should be selected such that a sufficient big distance remains between printing motif and the frame sides. When choosing the stencil material it has to be taken into consideration that there are water- and solvent-based flocking adhesives.

Squeegee and adhesive application

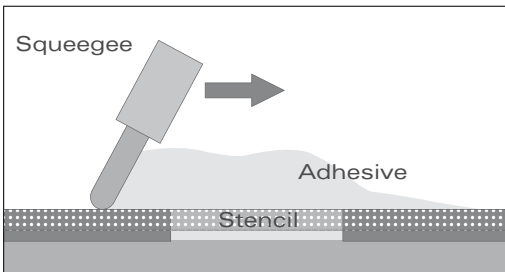
The length of the squeegee has to be selected such that the squeegee is wider than the motif by 50 mm approx. left and right. Squeegees with a thickness of 10 mm and 75 Shore strength have proven best. The squeegee blade has to be ground round, as otherwise a sufficient adhesive coating will not be possible. The number of



Screen

squeegee strokes and the necessary pressure depend on many different influences. It is recommended therefore to make trials prior to the actual production with each new squeegee and each new screen. A basic rule is: Start with two squeegee strokes with strong pressure in order to cover the textile with adhesive, followed by two more squeegee strokes with slight pressure in order to create a high adhesive layer. After the screen has been lifted off the adhesive must form a closed layer on the fabric. Compared to textile printing where the ink has to penetrate deeply into the fabric, when flocking one has to take care that a sufficiently thick layer of adhesive (approx. 0.15 to 0.25 mm, depending on the fibre length) lies on top of the textile, into which the flock fibres can penetrate.

With smaller series (e.g. 10 to 15 pieces per motif) usually the adhesive is applied manually. For larger quantities it is recommended to apply the adhesive automatically. This guarantees an even adhesive application as well as a faster production.



Screen printing of adhesive

Flocking

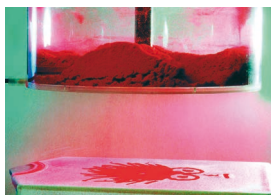
The flocking procedure is carried out with an electrostatic flocking equipment, which charges the flock fibres with a voltage of 50 to 100 kV, enabling the fibres to jump from the equipment to any grounded surface. Prerequisite for a good and washing resistant flocking is therefore that for flocking the textile is placed onto a metal sheet or a metal grid which is connected to the earth wire of the flocking equipment. Very often, the reason for a flocked textile having a poor washing resistance is the bad earthing during the flocking process.

For the flocking process the applicator is moved over the surface to be flocked with a slight shaking movement. With a distance of 10 cm approx. the first fibres are «shot» into the adhesive to act as stabilizer. After a few seconds, the distance of the applicator to the textile is reduced more and more in order to fill the flocked surface as dense as possible. Finally, the applicator is moved as near as possible over the motif without shaking in order to remove surplus flock fibres.

The flock fibres have to have a sufficient electrical conductivity for good flocking. This is achieved by the electrostatic treatment of the flock fibres. Such treatment however, can only work in connection with humidity. It is therefore important that the air humidity during the flocking procedure is according to the instructions of the flock producer. A too dry climate or a dried out flock may be recognized by the fact that it does not jump



Manual flocking



Automatic flocking

as individual fibres from the electrode to the part to be flocked, but forms trees and streaks formed by flock fibres clinging to each other. In this case, the flock fibres do not penetrate into the adhesive with the necessary energy and the flocking will not become abrasion resistant. When the humidity is too high, the flock becomes sticky and tends to form balls and agglomerations. It is strongly recommended to control temperature and humidity during flocking.

Drying and curing

Depending on the type of adhesive used, the flocked textile is placed onto a belt dryer, placed into a rack to dry at room temperature or in a drying oven or with small series just placed on hangers.

Drying and curing are two different procedures which run one after the other. In the first step the water or solvent of the adhesive is evaporated. Only after this is finished, curing can start, i.e. the adhesive can crosslink. This knowledge is very important especially with hot-curing adhesives. During the drying of water based adhesives the adhesive temperature must not rise over 100° C, as in the first step the water evaporates. If the heat is too high, steam bubbles might be generated within the adhesive rendering the flocking unusable. Only after the water has been removed out of the adhesive completely, the curing can be started with the required curing temperature. In order to keep constant



Drier with rack

drying and curing times for hot curing adhesives, it is necessary to operate the drier in the first step with a temperature of max. 100° C and sufficient fresh air input to remove the water. After the evaporation of the water the drier is heated up to curing temperature. During this step only a small amount of fresh air is required, in order to remove humidity and other evaporations.

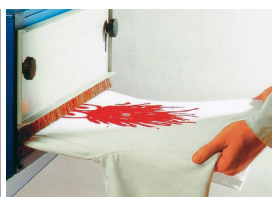
Please note: The use of a home sauna for drying is not recommended, as high temperatures might be achieved but no air circulates and therefore removing the air humidity is not possible.

Cleaning

After drying the adhesive the surplus flock may be removed by shaking, sucking off, brushing or by a combination of those methods. Special machines are available. With small series or with smooth textiles which do not retain the flock fibres on their surface simple methods of cleaning are quite sufficient.

Flock adhesive

Flock adhesives for textiles are two-component systems, i.e. adhesive and catalyst have to be mixed together prior to application. It is very important that the components are weighed precisely. Moreover, a suitable pigment should be added in order to dye the adhesive in the colour



T-shirt cleaning device

of the flock. With this measure the control of the correct adhesive coating is easier and also slightly bald spots are not so obvious. While a few percent of pigments added are sufficient for a dark flocking onto a light substrate, for white flocking at least 10% of white pigment has to be added. For a light flocking onto a dark textile (e.g. yellow flock on blue fabric) both white pigment as well as pigment in the flock colour have to be added as otherwise an optimum coverage and colour shine can't be achieved.

Flock

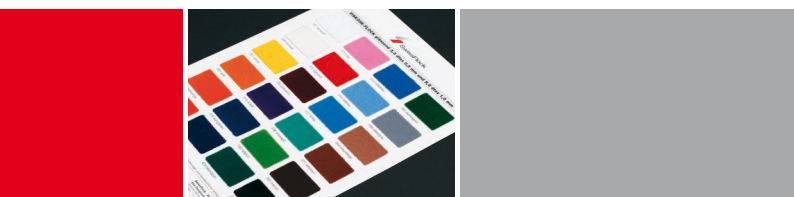
For the textile motif flocking, almost always flock made of polyamide (Nylon) and viscose (Rayon) are used. Both types of flock are offered in light fast, washing resistant and fast to bleeding qualities. The most common sizes are polyamide 3.3 dtex / 0.5 mm, polyamide 6.7 dtex / 1.0 mm, viscose 3.3 dtex / 0.5 mm and viscose 5.6 dtex / 1.0 mm. A very soft touch may be achieved by using 3.3 dtex / 1.0 mm. This size, however, is not as abrasion resistant as the types mentioned above. Moreover, the flocking with this size is not without problems, as the ratio of the fibre length to the fibre thickness is unfavourable and the siftability of the flock is not at its optimum. For door mats, mostly polyamide 22 dtex / 2 mm is used.



Adhesive, catalyst and pigment

Polyamide is sturdier, more elastic and more abrasion resistant than viscose. For soft textiles which are not strained very much, the stability of viscose is sufficient. For textiles with intense usage like floor mats or upholstery polyamide should be used.

Viscose contains more humidity than polyamide. Therefore viscose is more forgiving when the air humidity is too low. Nevertheless even when using viscose the air humidity should be within the recommended limits in order to prevent the flock from drying.



Viscose colour card 1 mm

Multi colour flocking

For high level flock prints, multi colour flocking is desired.

There are several possibilities:

- a) Flocking and drying of one colour, then flocking of the second colour next to it (only possible with simple motifs, very time consuming).
- b) Flocking of one colour onto the entire motif space, drying, then flocking of the second colour onto the already existing flock layer, etc. (very time consuming, flock onto flock is not very stable and the flocked area is stiff).
- c) Textile printing of several colours and flocking of the last colour only (this can create some very interesting effects).
- d) Multi colour flock transfers (see special description).
- e) MC-technique. Here, the adhesive is printed in form of the entire motif and the flock is applied into the adhesive colour after colour through a screen stencil (fabric 15 S, metallized polyester screen. Very nice motifs are achieved by this method. However, a lot of equipment is necessary as a carousel is recommended to have the individual screens fixed in exactly the same distance of the 1.1 fold flock length suspended freely).



Multi colour motif

SwissFlock

- > 1949 founded as department of the company Société de la Viscose Suisse («Viscosuisse») Emmenbruecke. It develops to be the leading flock producer in Europe. In the beginning only viscose flock is produced.
- > Ca. 1960 Starting the production of polyamide flock.
- > Ca. 1970 Starting the production of polyester flock.
- > 1990 Starting the production of bath dyed polyester flock.
- > 2001 Certification according to ISO 9001 and QS 9000.
- > 2002 Certification according to ISOTS 16949.
- > 2004 Certification according to ISO 14001.
- > 2005 The Joint Venture SwissFlock International in Kunshan / China is founded.
- > This group of companies is the largest flock producer worldwide.



Our strengths:

- Customer orientation > Constant dialogue with customers from different industries, e.g. automotive industry, textile industry, packaging industry.
- Innovation > Capability exchange with universities and research institutes.
- Customization > Several own product lines developed for market demands
- Experience > Know-how from many projects and applications

Our product range:

- Polyamide for universal use
- Viscose or cotton for low price or compostability
- Polyester for high UV resistance
- Carbon fibers for resistance to fire
- More types upon demand

We supply these types of flock from stock in all colours and sizes according to our colour cards. Other types are manufactured according to your demand.

Ask us! We advise you on the possible usages of flock, the appropriate technology and adhesive and the optimum type of flock.



Production



On the way to the customer